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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,931	09/21/2006	Yoshikazu Nakanishi	TLO-5-PCT/Minori	5457

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EXAMINER	
MIDKIFF, ANASTASIA	
ART UNIT	**PAPER NUMBER**
2882	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/593,931	NAKANISHI ET AL.	
	Examiner	Art Unit	
	ANASTASIA MIDKIFF	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *21-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *21-32* is/are allowed.

6)☒ Claim(s) *33,34,38 and 39* is/are rejected.

7)☒ Claim(s) *35-37,40 and 41* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 September 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: " 71' " and " 74' " (see Figure 9).

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be

notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Double Patenting

Claims 33 and 38 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 7, 9, 11, and 12 of copending Application No. 11/986,443. Although the conflicting claims are not identical, they are not patentably distinct from each other for the following reasons:

With respect to Claim 33, Claims 9 and 12 of the '443 application teach an ozone generator (Claim 9, Lines 1-2), comprising:

- a low pressure gas sealing housing (Claim 9, Lines 3-4);
- a hemimorphic crystal arranged in said housing (Claim 9, Lines 2-3);
- a heating and cooling means for repeatedly heating and cooling said hemimorphic crystal arranged in said housing (Claim 9, Lines 5-8); and,
- a vessel for a material gas for generating ozone (Claim 12, Lines 1-3), said vessel being arranged adjacently to an outside or inside of said housing (Claim 12, Lines 1-3), said vessel for the material gas for generating ozone being irradiated with soft x-rays generated from said hemimorphic crystal through an x-ray transmission window (Claim 9, Lines 9-12).

Claims 9 and 12 of the ‘443 application are narrower than Claim 33 of the present application, and, therefore, anticipate the limitations of Claim 33.

With respect to Claim 38, Claim 7 of the '443 application teaches an ozone generation method, comprising the steps of:

- arranging a hemimorphic crystal in a low pressure gas sealing housing, and repeatedly thermally exciting said hemimorphic crystal in a cycle of a predetermined period of time, and, thereby, continuously generating soft x-rays from said hemimorphic crystal, and generating ozone by irradiating a material gas for generating ozone with the x-rays.

Claim 7 of the '443 application is narrower than Claim 38 of the present application and, therefore, anticipates the limitations of Claim 38.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 33, 34, 38, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication to Zante (US 2003/0009075 A1) in view of U.S. Patent to Braunlich (US 3,840,748).

With respect to Claim 33, Zante teaches an ozone generator (Title and Abstract), comprising:

- a low pressure gas sealing housing (10; see Paragraph 46 and Figure 2);
- a radiation source (16) arranged in said housing (Figure 2); and,
- a vessel (26) for a material gas for generating ozone (Paragraph 46);
- said vessel being arranged adjacently to an inside of said housing (Figure 2);
- said vessel for the material oxygen gas for generating ozone being irradiated with radiation through a window (24; Paragraphs 50 and 60, and Figure 2).

Zante does not teach that said radiation source comprises a hemimorphic crystal that generates x-rays, and a heating and cooling means for repeatedly heating and cooling said hemimorphic crystal arranged in said housing.

Braunlich teaches an electron and x-ray generator (Title) wherein a hemimorphic crystal (5) is arranged in a housing (1) of the generator (Column 2, Lines 6-15 and Figure 1), and which includes a heating/cooling Peltier element (7) for repeatedly heating and cooling said hemimorphic crystal (Column 2, Lines 15-18), thereby generating x-rays (Column 2, Lines 11-14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ the hemimorphic crystal x-ray generator, as suggested by Braunlich, in the apparatus of Zante, to provide a simple and inexpensive irradiation source that does not require a high voltage power source, as suggested by Braunlich (Column 2, Lines 44-55).

With respect to Claim 34, Braunlich further teaches that an x-ray target (3) is arranged in the low pressure gas sealing housing (Figure 1), and wherein the soft x-rays and charged particle electron beams generated from the hemimorphic crystal are projected to said x-ray target (Column 2, Lines 6-14), and, thereby, said vessel for the material gas for generating ozone is irradiated with secondary x-rays generated from the target.

With respect to Claim 38, Zante teaches an ozone generation method (Title and Abstract), comprising the steps of:

- arranging a radiation source (16) in a low pressure gas sealing housing (10; see Paragraph 46 and Figure 2);
- generating ozone by irradiating an oxygen gas material with the radiation (Paragraphs 50 and 60, and Figure 2).

Zante does not teach that said radiation source comprises a hemimorphic crystal that continuously generates soft x-rays, and a heating and cooling means that repeatedly thermally excites said hemimorphic crystal in a cycle of a predetermined period of time.

Braunlich teaches an electron and x-ray generator (Title) wherein a hemimorphic crystal (5) is arranged in a housing (1) of the generator (Column 2, Lines 6-15 and Figure 1), and which includes a thermally exciting Peltier element (7) which repeatedly thermally excites said hemimorphic crystal in a cycle of a predetermined period of time (Column 2, Lines 15-18), thereby generating soft x-rays (Column 2, Lines 11-14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ the hemimorphic crystal x-ray generator, as suggested by Braunlich, in the apparatus of Zante, to provide a simple and inexpensive irradiation source that does not require a high voltage power source, as suggested by Braunlich (Column 2, Lines 44-55).

With respect to Claim 39, Zante teaches an ozone generation method (Title and Abstract), comprising the steps of:

- arranging a radiation source (16) in a low pressure gas sealing housing (10; see Paragraph 46 and Figure 2);
- generating ozone by irradiating an oxygen gas material with the radiation (Paragraphs 50 and 60, and Figure 2).

Zante does not teach that said radiation source comprises a hemimorphic crystal that generates x-rays and charged particles, and inducing an intensive electric field so as to generate and project x-rays and charged particles from said hemimorphic crystal to an x-ray target, thereby irradiating the material gas with said secondary x-rays so as to generate the ozone.

Braunlich teaches an electron and x-ray generator (Title) wherein a hemimorphic crystal (5) is arranged in a housing (1) of the generator (Column 2, Lines 6-15 and Figure 1), and which includes a thermally exciting Peltier element (7) which induces an intensive electric field in said hemimorphic crystal (Column 2, Lines 15-18), thereby generating charged particles and x-rays that strike a target (3) forming secondary x-rays (Column 2, Lines 11-14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ the hemimorphic crystal x-ray generator, as suggested by Braunlich, in the apparatus of Zante, to provide a simple and inexpensive irradiation source that does not require a high voltage power source, as suggested by Braunlich (Column 2, Lines 44-55).

Allowable Subject Matter

Claims 21-32 are allowed.

Claims 35-37, 40, and 41 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

With respect to Claim 21, the prior art of record teaches many of the elements of the claimed invention, including an x-ray generator, comprising: a vessel for holding a low pressure gas atmosphere inside; hemimorphic crystal supporting means provided in said vessel; at least a pair of hemimorphic crystals supported by said supporting means in said vessel; and a heating and cooling means for elevating and lowering a temperature of said hemimorphic crystals, wherein x-rays are irradiated from said vessel as the temperature of said hemimorphic crystals are elevated or lowered.

However, prior art does not teach or fairly suggest the apparatus wherein said at least a pair of hemimorphic crystals are arranged oppositely to each other at a distance there between, in the manner required by Claim 21.

With respect to Claim 27, the prior art of record teaches many of the elements of the claimed invention, including an x-ray generator, comprising: a vessel for holding a low pressure gas atmosphere inside; hemimorphic crystal supporting means provided in said vessel; at least a pair of hemimorphic crystals supported by said supporting means in said vessel; a metal target supported by a target supporting means in said vessel; and a heating and cooling means for elevating and lowering a temperature of said hemimorphic crystals, wherein x-rays are irradiated from said vessel as the temperature of said hemimorphic crystals are elevated or lowered.

However, prior art does not teach or fairly suggest the apparatus wherein said at least a pair of hemimorphic crystals are arranged oppositely to each other at a distance there between, and wherein the target surrounds a space between said pair of hemimorphic crystals, in the manner required by Claim 27.

With respect to Claim 30, the prior art of record teaches many of the elements of the claimed invention, including an x-ray generator, comprising: a vessel for holding a low pressure gas atmosphere inside; hemimorphic crystal supporting means provided in said vessel; at least a pair of hemimorphic crystals supported by said supporting means in said vessel; a heating and cooling means for elevating and lowering a temperature of said hemimorphic crystals; and a metal target supported by a target supporting means in said vessel.

However, prior art does not teach or fairly suggest the apparatus wherein said at least a pair of hemimorphic crystals are hemimorphic crystal aggregates arranged oppositely to each other at a distance there between; said aggregates being composed of a number of hemimorphic crystals supported on a base and concavely curved, all of the crystals in one aggregate facing positively charged planes toward a side apart from the base and all of the hemimorphic crystals in the other aggregate facing negatively charged planes toward the side apart from said base, said pair of aggregates being arranged oppositely to each other at a concave side apart from said base thereof; and wherein the target is arranged in a space between said pair of hemimorphic crystal aggregates, in the manner required by Claim 30.

With respect to Claim 32, the prior art of record teaches many of the elements of the claimed invention, including an x-ray generator, comprising: a vessel formed of a material for blocking x-ray transmission and for holding a low pressure gas atmosphere inside; hemimorphic crystal supporting means provided in said vessel; at least a pair of hemimorphic crystals supported by said supporting means in said vessel; a heating and cooling means for elevating and lowering a temperature of said hemimorphic crystals; and a metal target supported by a target supporting means in said vessel.

However, prior art does not teach or fairly suggest the apparatus wherein said at least a pair of hemimorphic crystals are hemimorphic crystal aggregates arranged oppositely and joined to each other through a dielectric material; said aggregates being composed of a number of hemimorphic crystals supported on a concave side of hemispherical shell-shaped bases, all of the crystals in one aggregate facing positively

charged planes toward a side apart from the base and all of the hemimorphic crystals in the other aggregate facing negatively charged planes toward the side apart from said base, said pair of aggregates being arranged oppositely to each other at a concave side apart from said base thereof and joined to each other through a ring-shaped dielectric material so as to form a spherical shell; and wherein the target is arranged in said spherical shell at a position including a center of said spherical shell, at least one of said aggregates being provided with one through hole so that an x-ray transmission window aligns with said at least one through hole, in the manner required by Claim 32.

With respect to Claim 35, the prior art of record teaches many of the element of the claimed invention, including an ozone generator, comprising: a low pressure gas sealing housing; a hemimorphic crystal arranged in said housing; a heating and cooling means for repeatedly heating and cooling said hemimorphic crystal arranged in said housing; and, a vessel for a material gas for generating ozone; said vessel being arranged adjacently to an outside or an inside of said housing; said vessel for the material gas for generating ozone being irradiated with soft x-rays generated from said hemimorphic crystal through an x-ray transmission window.

However, prior art fails to teach or fairly suggest the apparatus wherein a hollow cathode is arranged around the hemimorphic crystal, in the manner required by Claim 35.

With respect to Claim 36, the prior art of record teaches many of the element of the claimed invention, including an ozone generator, comprising: a low pressure gas sealing housing; at least two hemimorphic crystals arranged in said housing; a heating

and cooling means provided to each crystal for repeatedly heating and cooling said hemimorphic crystal arranged in said housing; and, a vessel for a material gas for generating ozone; said vessel being arranged adjacently to an outside or an inside of said housing; said vessel for the material gas for generating ozone being irradiated with soft x-rays generated from said hemimorphic crystal through an x-ray transmission window; and wherein a ring-shaped ozonation chamber is arranged in said apparatus.

However, prior art fails to teach or fairly suggest the apparatus wherein said at least two hemimorphic crystals are arranged oppositely to each other at a space there between, wherein said ozonation chamber is arranged at a side of the space, and wherein said crystals thermal excitation takes place in a same phase or an opposite phase, in the manner required by Claim 36.

With respect to Claim 37, the prior art of record teaches many of the element of the claimed invention, including an ozone generator, comprising: a low pressure gas sealing housing; at least two hemimorphic crystals arranged in said housing; a heating and cooling means provided to each crystal for repeatedly heating and cooling said hemimorphic crystal arranged in said housing; and, a vessel for a material gas for generating ozone; said vessel being arranged adjacently to an outside or an inside of said housing; said vessel for the material gas for generating ozone being irradiated with soft x-rays generated from said hemimorphic crystal through an x-ray transmission window; and wherein an ozonation chamber is arranged in said apparatus.

However, prior art fails to teach or fairly suggest the apparatus wherein said at least two hemimorphic crystals are arranged oppositely to each other at a space there

between along an arched surface, and wherein said ozonation chamber is arranged at a center portion of said arched surface, in the manner required by Claim 37.

With respect to Claims 40 and 41, the prior art of record teaches many of the elements of the claimed invention including an ozone generation method, comprising the steps of: arranging and repeatedly thermally exciting a number of hemimorphic crystals in a sealed low pressure gas housing for a cycle of a predetermined period of time, thereby generating x-rays and charged particles; inducing an intensive electric field so as to generate and project x-rays and charged particles from said hemimorphic crystals to an x-ray target, thereby generating secondary x-rays; generating ozone by irradiating an oxygen gas material with the x-rays and/or the secondary x-rays.

However, prior art does not teach or fairly suggest the method wherein said crystals are arranged oppositely to each other, and wherein said thermal excitation is performed so that the cycles of said crystals are in a same phase or in opposite phases, in the manner required by Claims 40 and 41.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent Documents to: Das Gupta (US 4,894,852) teaches the use of two oppositely facing non-hemimorphic crystals to generate x-rays, but using electron beams to excite the crystals; Grodzins (US 7,266,178 B2) teaches using a hemimorphic crystal and a heating/cooling element to generate x-rays; Ohmi et al. (US 5,750,011)

teaches an ionizing apparatus using soft x-rays to produce ions; and Orr, Jr. et al. (US 4,095,115) and Mizuno et al. teach ozone generators using electron and soft x-ray beam radiation to produce ozone.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANASTASIA MIDKIFF whose telephone number is (571)272-5053. The examiner can normally be reached on M-F 7-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on 571-272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. M./
Examiner, Art Unit 2882
8/10/08

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